STUDIES IN THEACEAE, I
EURYA SUBGEN. TERNSTROEMIOPSIS

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With plate 153

DURING the past year the author has been making a survey of the Old World Theaceae, starting with a critical study of the genus *Eurya*.

The genus as a whole has presented some rather difficult problems in specific delimitation and in synonymy which cannot be settled until more ample material or photographs of types deposited in various foreign herbaria can be had.

In Szyszylowicz's treatment,[1] *Eurya* comprises three sections: Cleyera (DC.), Freziera (Sw.) and Proteurya Szysz. In 1896, Urban[2] separated *E. sandwicensis* from Proteurya and made it the type of the new genus, *Ternstroemiopsis*. The following year Engler[3] united *Ternstroemiopsis* with *Eurya* as a new subgenus, elevating, at the same time, the three sections of Szyszylowicz to subgeneric rank. At present, however, *Eurya* is generally considered as containing but two subgenera, Proteurya and Ternstroemiopsis, while *Cleyera* and *Freziera* represent distinct genera, the former Asiatic and American, the latter exclusively American.

In this paper, the subgenus Ternstroemiopsis is considered. This is distinguished from the subgenus Proteurya by the spiral arrangement of its leaves, the thick glandular sepals, fleshy petals and stamens whose anthers are twice as long as the filaments. Proteurya is characterized by two-ranked leaves, petals more or less membranous and anthers as long as or shorter than the filaments. Geographically also Ternstroemiopsis is distinct being confined solely to the Hawaiian Islands while Proteurya, although found in nearly all the Pacific islands and Asia, does not invade the Hawaiian group with a single species.

The institutions from which material for this study was borrowed along with the abbreviations used in this paper, are as follows: herbarium of the Arnold Arboretum of Harvard University (AA), herbarium of Otto Degener (D), Gray Herbarium of Harvard University (Gr), herbarium of the New York Botanical Garden (NY).

[1]Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 189 (1893).
[2]Urban in Ber. Deutsch. Bot. Gesell. **14**: 49 (1896).
[3]Engler in Engler & Prantl, Nat. Pflanzenfam. Nachtr. **1**: 247 (1897).

KEY TO THE SPECIES AND VARIETIES

A. Leaves subcordate or truncate at base, obtuse or rounded at apex
  B. Small trees or erect shrubs ..... 1. *E. sandwicensis*
  BB. Prostrate shrubs ..... 1a. *E. sandwicensis* var. *prostrata*
AA. Leaves cuneate at base, acute at apex
  C. Leaves 3.5–4.7 cm. long, 1.2–1.7 cm. wide..... 2. *E. Degeneri*
  CC. Leaves either larger or smaller than C
    D. Leaves 5.3–8.7 cm. long, 2.5–3.5 cm. wide
      2a. *E. Degeneri* f. *grandifolia*
    DD. Leaves 3.0–4.5 cm. long, 0.7–1.2 cm. wide
      2b. *E. Degeneri* f. *stenophylla*

1. **Eurya sandwicensis** A. Gray, Bot. U. S. Expl. Exped. 1838–1842, **1:** 209 (1854). — H. Mann in Proc. Amer. Acad. Arts Sci. **7:** 156 (Enum. Hawaiian Pl.) (1867); Mem. Boston Soc. Nat. Hist. **1:** 534, 539 (1869). — Hillebrand, Fl. Haw. Isl. 41 (1888). — Drake del Castillo, Ill. Fl. Ins. Maris Pacif. 117 (1890). — Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III, **6:** 190 (1893). — A. A. Heller in Minn. Bot. Studies, **1:** 856 (1897). — Rock, Indig. Trees Haw. Isl. 308 (1913). — Melchior in Engler & Prantl, Nat. Pflanzenfam. Ed. 2, **21:** 147 (1925).

Eurya sandwicensis A. Gray var. *sessilifolia* A. A. Heller in Minn. Bot. Studies, **1:** 856 (1897), as a synonym.

Ternstroemiopsis sandwicensis Urban in Ber. Deutsch. Bot. Ges. **14:** 49 (1896).

Small trees, 5–6 m. in height, occasionally shrubby in higher altitudes, 2–3 m.; branches crowded with leaves, ultimate branchlets strigose; leaves oblong, elliptical or obovate, coriaceous, glabrous, occasionally strigosely hairy on midrib, 4.5–9.0 cm. long, 1.5–3.7 cm. wide, on short petioles 2–3 mm. long, sometimes subsessile, obtuse or rounded at the apex, more or less cordate, occasionally truncate at the base, closely serrulate with inflexed mucronulate teeth, veins and veinlets finely reticulate beneath, reddish brown in color; flowers solitary, occasionally two in axils, nodding, ebracteolate, pedicels approximately 5 mm. long; calyx purplish brown, quite coriaceous, subtended by two small unequal bracts; sepals five, unequal, 3–4 mm. long, persistent, suborbicular, thick in central portion, membranous, lighter in color and slightly glandular on margin, occasional strigose hairs on external surface; corolla pale yellow or cream-color, imbricated; petals five, obovate, 5–6 mm. long, united at base, somewhat fleshy in central portion; stamens in staminate flowers 10–15, slightly adnate to base of corolla, filaments distinct, half as long as the oblong mucronate anthers; staminodia in pistillate flowers, five sometimes six, 2–3 mm. long; pistil having three or occasionally

four styles, sometimes connate nearly to stigma, usually divided; stigmas three (or four); ovary glabrous, 3-celled, axial placentation; fruit a globose berry, 7–10 mm. across, dark blue-black, many-seeded; mature persistent, subcordate calyx-lobes 8 mm. long, 7.5 mm. across at widest portion, lobes at base lighter in color and more membranous.

SPECIMENS EXAMINED:

HAWAIIAN ISLANDS. O a h u : Nuuanu-Pali, *U. Faurie,* no. 284, October 1909 (AA); on mountains behind town of Honolulu, *Wm. Rich,* collected in 1840 (type) (Gr, NY); exact locality lacking, *M. J. Remy,* no. 562, collected 1851–1855 (Gr); data lacking, *M. J. Remy* (NY); exact locality lacking, *H. Mann & W. T. Brigham,* no. 524, collected 1864–1865 (Gr, NY); exact data lacking, *W. Hillebrand* (Gr); precise data lacking, *C. Gaudichaud,* collected probably 1836 (Gr); in rain-forest from Kahana church up ridge to summit of mountain southeast of Kahana Bay, *O. Degener,* no. 8680, July 3, 1932 (AA, D); Waipio, Waiawa Ridge, on Dicranopteris-covered ridge, *O. Degener & Dr. C. L. Shear,* no. 9838, March 5, 1928 (tree 15 ft.; fruit inky blue-black) (AA, D); open forest in Dicranopteris tangle, Manana Gulch ridge, *O. Degener, W. Bush & K. K. Park,* no. 8679, October 2, 1932 (AA, D); on and near the summit of Konahuanui, *A. A. Heller,* no. 2240, May 2, 1895 (NY); lower slopes of Konahuanui, above Manoa, *A. A. Heller,* no. 2311, May 13, 1895 (AA, NY, Gr); ridge west of Kalihi valley, *C. N. Forbes,* no. 1483.O, March 17, 1910 (NY); ridge between Pololo and Waialue iki, *C. N. Forbes,* no. 2408.O, January 30, 1917 (NY); Koolau Mts., Pumaluu, *J. F. Rock,* no. 627, December 3–10, 1908 (Gr); Pumaluu, *J. F. Rock,* no. 843, December 1908 (NY); precise data lacking; *J. F. Rock,* collected 1910 (Gr). K a u a i : Mt. Waialeale, alt. 5200 ft., *J. F. Rock,* no. 8864, October 20, 1911 (Gr, NY); along stream-beds, Kaholuamano, *J. F. Rock,* no. 5499, September 1909 (Gr, NY); Kaholuamano, *J. F. Rock,* collected March 3–10, 1909 (NY); Hanapepe, *U. Faurie,* no. 286, December 1909 (AA). M a u a i : Honakahau Drainage Basin, *C. N. Forbes,* no. 421.M, September 25–October 17, 1917 (NY). H a w a i i : Kilauea, near fern-forest, *O. Degener,* no. 8678, November 10, 1929 (AA, D).

In the whole genus this species is probably the most outstanding. Although confined to the Hawaiian group, it has been found in nearly all the islands from which material has been collected. The flowers and fruit are nearly twice the size of any other species. Along with this size character can be mentioned the distinct reddish reticulate veining of the lower surface of the leaf and the subcordate or truncate base of the leaf.

The collections of Otto Degener made during the last few years on

the various islands of the group had great influence in the decision finally to place the majority of Hawaiian specimens in this species. His specimens were so ample that it was possible to make two and even three sheets of each for the herbarium of the Arnold Arboretum. These sets of material show great gradation in leaf-size — a character which might cause some, especially in this genus, to describe new species.

Faurie's specimen, no. 286, according to the collector, was made at Hanapepe, Oahu. This probably is a mechanical error made in transferring the field notes to the herbarium label. Hanapepe is on the island of Kauai and the collection date of no. 286 agrees with other material collected by Faurie on Kauai.

1a. **Eurya sandwicensis** A. Gray var. **prostrata,** var. nov.

A typo recedit habitu prostrato et foliis remotis.

SPECIMENS EXAMINED:

HAWAIIAN ISLANDS. M o l o k a i : At edge of windswept forested pali, Ohialele Pali, *O. Degener,* no. 8676 (type, AA) May 10, 1928 (more or less trailing along ground with branches sometimes eight feet long; flowers yellow, difficult to distinguish plant from *Vaccinium*) (AA, D); Pelekunu trail, *C. N. Forbes,* no. 249.Mo, July 1912 (NY).

A quotation from a recent letter from Otto Degener, the collector of the cited type throws considerable light on this variety and the species *E. sandwicensis* : — "*Eurya,* as I have found it on Oahu, grows as an erect small tree with very dense foliage. It is rare, and where found, usually grows in openings in the lower forest, covered over with *Gleichenia.* Rainfall would be moderate."

"The Molokai specimen I have found nowhere except in a typical dense extremely rainy rain-forest, and curiously enough, not anywhere in that region but only on the brink of a cliff extending for several miles. In short, it grows on the very "backbone" of Molokai where the rain and fog drive violently over the mountain crest. I collected five months on Molokai and do not remember seeing any *Eurya* except in that one type of locality. The rain-forest reaches up to this cliff and it is among the shrubs and small trees immediately overlooking the cliff that the *Eurya* is to be found. The plant sprawls rather than creeps, producing slender branches of unusual length—possibly 12 feet—with its leaves spaced far apart."

The collector remarked further that at first on seeing sterile plants, he thought this variety to be a low-growing *Vaccinium.* However, later on finding flowering material, he discovered it to be an *Eurya.* He suggested it as a variety or possible new species.

The second cited specimen, Forbes no. 249.Mo, resembles the type

in the remoteness of leaves. However the habit of the plant was not given by the collector, but it appears to be prostrate.

2. **Eurya Degeneri,** spec. nov.; a *E. sandwicensi* A. Gray foliis ellipticis 3.5–4.7 (2.5–6.5) cm. longis, 1.2–1.7 (1.2–2.2) cm. latis, apice acutatis et emarginatis, basi cuneatis recedit.

Branches covered with leaves especially at ends, ultimate branchlets sparsely strigose; leaves elliptic, coriaceous, 3.5–4.7 (2.5–6.5) cm. long, 1.2–1.7 (1.2–2.2) cm. wide, acute at the apex, emarginate, cuneate at the base, closely serrulate with inflexed mucronulate teeth, conspicuously reticulate on under surface, veins and veinlets reddish brown in color, especially near base of leaf where color spreads into the leaf; petiole 3 mm. long; mature flowers unknown, bud resembling *E. sandwicensis* sufficiently in coriaceous character and color of calyx with occasional strigose hairs, character and number of stamens and corolla to show it to be typical of the genus and closely related to *E. sandwicensis;* berry (probably not mature) blue-black, 5 mm. across with the persistent styles separate to near the base, 3-celled, axial placentation, many-seeded.

Specimens Examined:

Hawaiian Islands. Kauai: open forest, Waineke swamp Kokee, *O. Degener,* no. 8675 (type AA) July 1, 1926 (AA, D); high plateau of Waimea, Halemanu to Kaholuamano, *J. August Kusche,* nos. 28, 139, 140, collected in 1919 (AA); Kilauea, *U. Faurie,* no. 285, January 1910 (AA); west side Waimea Drainage Basin, Kanaikinaua, *C. N. Forbes,* no. 1016.K, July 3–August 18 (1917) (AA, NY).

This species is very closely allied to *E. sandwicensis.* The leaf characters are most distinctive between the two species. *Eurya Degeneri* has elliptical leaves, cuneate at the base, acute and emarginate at the apex. On the other hand, *Eurya sandwicensis* has leaves which are oblong or elliptic, subcordate or truncate at base and rounded or obtuse at the apex. *Eurya Degeneri* and its varieties are confined to the island of Kauai, while *Eurya sandwicensis* is found on nearly all the islands including Kauai.

Otherwise these two species belonging to this distinctive section of the genus are very similar. This is especially true in flower and fruit characters. Although the mature flowers and fruit were not available in *E. Degeneri,* the material such as it is shows conclusively that there is a great resemblance.

It is a pleasure to dedicate this species to Otto Degener of Hawaii, whose recent collections from the islands are extremely fine and whose material of *Eurya* aided tremendously in clearing up this section.

2a. **Eurya Degeneri** Kobuski forma **grandifolia** (Wawra), comb. nov.

Eurya sandwicensis A. Gray β var. Hillebrand, Fl. Hawaiian Isl. 41 (1888). — Drake del Castillo, Ill. Fl. Ins. Maris Pacif. 117 (1890).

Eurya sandwicensis A. Gray var. *grandifolia* Wawra in Flora, **56**: 168 (1873). — J. F. Rock, Indig. Trees Haw. Isl. 308 (1913).

A typo recedit foliis amplioribus, 5.3–8.7 cm. longis, 2.5–3.5 cm. latis.

SPECIMEN EXAMINED:

HAWAIIAN ISLANDS: K a u a i : Wainiha, *U. Faurie,* no. 298, January 1910 (AA).

This large-leaved form has seemed rather evasive to most collectors. Hillebrand, Del Castillo, Wawra and Rock have made reference to it in literature. The first three in their treatments were working with a single specimen, that of Wawra collected at Kealia on the island of Kauai. Incidentally we have only the single specimen collected by Faurie (no. 298) collected at Wainiha. The Faurie specimen was collected on the north coast of Kauai while Wawra made his collection on the west coast.

Rock, although having collected considerably on the islands, never encountered this large-leaved form. However, he collected the narrow-leafed form cited next.

These two forms like the species have distinctly cuneate leaf-bases and acute apices. Their variation from the species lies chiefly in the leaf size. Again, like the species, they are found only on the island of Kauai.

2b. **Eurya Degeneri** Kobuski forma **stenophylla,** forma nov.

A typo recedit foliis minoribus angustioribusque, 3.0–4.5 cm. longis, 0.7–1.2 cm. latis.

SPECIMEN EXAMINED:

HAWAIIAN ISLANDS. K a u a i : precise locality and date of collection lacking, *J. F. Rock,* no. 17274 (type) (AA).

Unfortunately, the Rock specimen cited above is sterile and was placed in this genus under *E. sandwicensis* with some hesitation by an earlier student. At first, I was quite dismayed because I felt that it belonged to a species other than *E. sandwicensis,* but because of the lack of flowers or fruit I hesitated to describe it as new. It was not until more material came to my attention that its true affinity with *E. Degeneri* was discovered.

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